# PATENT ABSTRACTS OF JAPAN

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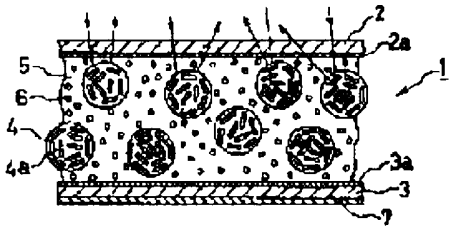
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## (54) REFLECTED LIGHT TYPE COLOR LIQUID CRYSTAL DEVICE ELEMENT

(57)Abstract:
PURPOSE: To display in color through reflected light even under an extremely bright environment such as under direct sunlight and the like by coloring the base material of high molecular dispersion type liquid crystal constituted through dispersing liquid crystal capsules in the base material.
CONSTITUTION: A reflex color liquid crystal 1, where transparent base material 5 made of for instance ultraviolet setting resin, in whose inside liquid crystal capsules 4 are uniformly dispersed between a front board 2 and a back board 3 on which transparent electrodes 2a and 3a are respectively provided, is sealed, has a form of what is called high molecular dispersion type liquid crystal. This time the inside of the base material 5 is colored by pigment 6 with adequate hue, and the back face side of the back board 3a is for instance deposited with aluminum or coated in silver color so as to form a reflector 7. Since the base material 4 is colored by the pigment 6, reflected light radiated from the reflex color liquid crystal 1 in a direction of monitoring is naturally colored so as to display in color. That is, a colored graphic form is displayed on white backing.




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## CLAIMS

[Claim(s)]

[Claim 1] Into the base material which consists of a transparent resin between the substrates of a couple, carry out distributed **** closure of the liquid crystal capsule, and a cell is formed. It is the polymer dispersed liquid crystal display device which prepares a reflecting plate in the tooth back of this cell, and changes. The reflected light type electrochromatic display display device characterized by distributing a pigment in the aforementioned base material, reflecting an incident light by the aforementioned reflecting plate at the time of the drive of the aforementioned liquid crystal capsule, and for the pigment in the aforementioned base material coloring this reflected light, and considering as color display.

[Claim 2] A light filter is prepared in the aforementioned reflecting plate side, and the aforementioned base material is made into one unit by three while it is formed as pillar-shaped in contact with each substrate in each edge between the aforementioned substrates. Each of the aforementioned pillar-shaped section of each unit is a reflected light type electrochromatic display display device according to claim 1 characterized by aforementioned base material and the aforementioned light filter which are produced at the time of the drive of the aforementioned liquid crystal capsule may serve as R, G, and B three primary colors, respectively.

## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention aims at obtaining that which makes it possible to perform color display by the reflected light to the aforementioned electrochromatic display display device in detail about an electrochromatic display display device.

[0002]

[Description of the Prior Art] The liquid crystal display element 91 which it is drawing 4 which shows the example of the composition of the conventional electrochromatic display display device 90, for example, has SHATA operations, such as a STN liquid crystal display element Although the light filter 92 of R (red), G (green), and B (blue) was put together, the light source 93 is arranged in the tooth back. It is the thing which makes the light from the aforementioned light source 93 penetrate by driving the liquid crystal display element 91 of the position corresponding to the color which

what also penetrates a light filter 92 at the same time the light from the aforementioned light source 93 penetrates the liquid crystal display element 91 at this time, coloring is performed, and color display is performed.

[0003]

[Problem(s) to be Solved by the Invention] However, it sets to said conventional electrochromatic display display device 90. The luminosity of the display obtained becomes what is defined with the luminosity of the aforementioned light source 93. For example, the luminosity of the circumferences, such as the outdoors at the time of fine weather, became impossible [ reading a display in the very bright state ], the trouble referred to as that the display device suitable for the device by which an outdoor use is made usual is not obtained was produced, and solution of this point had considered as the technical problem.

[0004]

[Means for Solving the Problem] As a concrete means for solving said conventional technical problem, into the base material which consists of a transparent resin between the substrates of a couple, this invention carries out distributed **** closure of the liquid crystal capsule, and forms a cell. It is the polymer dispersed liquid crystal display device which prepares a reflecting plate in the tooth back of this cell, and changes. In the aforementioned base material, shall distribute a pigment and an incident light shall be reflected by the aforementioned reflecting plate at the time of the drive of the aforementioned liquid crystal capsule. Said conventional technical problem is solved by offering the reflected light type electrochromatic display display device characterized by for the pigment in the aforementioned base material coloring this reflected light, and considering as color display.

[0005]

[Example] Below, this invention is explained in detail based on the example shown in drawing. It is the first example of this invention which is shown in drawing 1 , and it is the reflected light type electrochromatic display display device (below, it is called for short the reflected type electrochromatic display 1) which is shown with a sign 1 all over drawing.

[0006] The aforementioned reflected type electrochromatic display 1 between the front substrates 2 and the tooth-back substrates 3 by which transparent electrodes 2a and 3a were formed in each The liquid crystal capsule 4 is the thing which closed the transparent base material 5 which was uniformly distributed inside, and which changes, for example by ultraviolet-rays hardening resin and which has the so-called gestalt of a polymer dispersed liquid crystal, at this time Into the aforementioned base

material 5, it shall be performed by the pigment 6 of a proper hue in coloring, for example, aluminum vacuum evaporationo or silver paint shall be performed to the tooth-back side of the aforementioned tooth-back substrate 3, and it shall be formed in the reflecting plate 7.

[0007] Subsequently, if the operation and effect of the reflected type electrochromatic display 1 which were considered as the above-mentioned composition are explained First, the state where potential is not impressed to the aforementioned transparent electrodes 2a and 3a or aforementioned transparent-electrode 2a. In the place where 3a is not laid, liquid crystal molecule 4a in the liquid crystal capsule 4 will be in the random state where it does not have specific directivity, as this showed drawing 1 , reflects outdoor daylight irregularly and reflects it as the diffused light.

[0008] In this state, since the reflected light from the liquid crystal capsule 4 near the aforementioned front substrate 2 becomes superior, coloring is hardly accepted in the reflected light described above although coloring was performed by the pigment 6, therefore the aforementioned base material 5 carries out view ** of the front face of the reflected type electrochromatic display 1

aforementioned transparent electrodes 2a and 3a, liquid crystal molecule 4a in the aforementioned liquid crystal capsule 4 follows here, Will be in a state perpendicular to the aforementioned front substrate 2 and the tooth-back substrate 3, make outdoor daylight penetrate, make the aforementioned reflecting plate 7 reach, as shown in drawing 2 , the reflected light further reflected by the aforementioned reflecting plate 7 is made to penetrate again, and it is made to emit towards the exterior of the reflected type electrochromatic display 1 from the aforementioned front substrate 2.

[0010] It becomes that to which it becomes that by which coloring is naturally performed to the reflected light which sees from the reflected type electrochromatic display 1, and is emitted to a visual direction, and color display is performed by coloring by the pigment 6 being performed to the aforementioned base material 5 at this time, namely, a display is performed on a white ground in a colored figure (character).

[0011] As opposed to it having been the second example of this invention which is shown in drawing 3 similarly, and the first front example having been the color display in a single color this second example It is what performs the so-called full color display, a base material 50 by

pillar-shaped in contact with each substrate 2 and 3 between the front substrate 2 and the tooth-back substrate 3. further namely, the base material 50 of the shape of an aforementioned pillar As described above, it shall consider as one unit by three, 50M colored the Magenta with the proper pigment 6 etc., 50Y colored yellow, and 50C colored cyanogen, and it shall be prepared in the plurality of this unit.

[0012] In addition, it shall be prepared in a light filter 8 at the aforementioned reflecting plate 7 side of these base materials 50. Light-filter 8Y made into the yellow color to base-material 50M made into the Magenta color shall be put together, and red (R) light shall be produced in the reflected light. To base-material 50Y of a yellow color, light-filter 8C of a cyano color shall be put together similarly, and green (G) light shall be produced in the reflected light. To base-material 50C of a cyano color, light-filter 8M of a Magenta color shall be put together, and blue (B) light shall be produced in the reflected light. It becomes that from which the three primary colors (color addition) of light are obtained, and if this is controlled per 1 unit of the aforementioned base material 50, the so-called full color display can be performed.

[0013]

[Effect of the Invention] By combining with a proper light filter, while coloring it coloring it the aforementioned base material of the polymer dispersed liquid crystal which carries out distributed **** composition of the liquid crystal capsule into a base material by this invention, or a base material, as explained above It becomes that from which the electrochromatic display which can perform color display by the reflected light is obtained, for example, color display is made possible also in very bright environment-izing, such as the bottom of direct rays, and the effect excellent in expansion of the service condition of the device by which this kind of electrochromatic display display device is adopted etc. is done so. Moreover, the light source with which the tooth back needed by having considered as the reflected light type in order to display conventionally is equipped also does so the effect which presupposed that it is unnecessary and was excellent also in cost cuts, such as reduction of power consumption, and simplification of composition.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the cross section showing the first example of the reflected light type electrochromatic display display device concerning this invention in the state where the drive is not performed.

[Drawing 2] It is the cross section showing the drive state of the same example.

[Drawing 3] It is the cross section showing the second example of this invention similarly.

[Drawing 4] It is the cross section showing the conventional example.

[Description of Notations]

1 .... Reflected light type electrochromatic display display device

2 .... Front substrate

2a .... Transparent electrode

3 ... Tooth-back substrate

3a .... Transparent electrode

4 ... Liquid crystal capsule

5 50 .... Base material

50M .... Magenta chromophore material

50Y .... Yellow chromophore material

50C .... Cyanogen chromophore material

6 ... Pigment

7 .... Reflecting plate

8 ... Light filter

8M .... Magenta color light filter

8Y .... Yellow color light filter

8C .... Cyanogen color light filter

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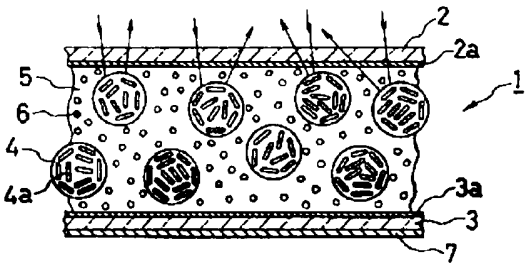
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(54)【発明の名称】　反射光型カラー液晶表示素子

(57)【要約】

【目的】　従来のカラー液晶表示素子においては、液晶表示素子が透過光式とされて背面に光源を備えるものとされていたので、例えば屋外など周囲の明るい状態では光源の光量が不足し読取が不可能となる問題点を生じていた。

【構成】　基材５中に液晶カプセル４を分散せて構成する高分子分散型液晶の前記基材５に着色を行うことで、反射光によりカラー表示が行えるカラー液晶１が得られるものとなり、周囲の状況、特に極度に明るい状態においても表示を可能として課題を解決する。



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【特許請求の範囲】

【請求項1】　一対の基板間に透明樹脂よりなる基材中に液晶カプセルを分散せて封止してセルを形成し、該セルの背面には反射板を設けて成る高分子分散型液晶表示素子であり、前記基材中には顔料を分散し前記液晶カプセルの駆動時には入射光を前記反射板で反射させるものとし、該反射光を前記基材中の顔料により着色してカラー表示とすることを特徴とする反射光型カラー液晶表示素子。

【請求項2】　前記基材は前記基板間で夫々の端部を夫々の基板に接する柱状として形成されると共に前記反射板側にはカラーフィルタが設けられて3本で1ユニットとされ、各ユニットの前記柱状部の夫々は前記液晶カプセルの駆動時に生ずる前記基材と前記カラーフィルタとを透過した後の反射光の色相が夫々R、G、Bの原色となるように構成されていることを特徴とする請求項1記載の反射光型カラー液晶表示素子。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明はカラー液晶表示素子に関するものであり、詳細には、前記カラー液晶表示素子に対し、反射光によりカラー表示を行うことを可能とするものを得ることを目的とするものである。

【０００２】

【従来の技術】従来のカラー液晶表示素子９０の構成の例を示すものが図４であり、例えばＳＴＮ液晶表示素子などシャター作用を有する液晶表示素子９１と、Ｒ（赤）、Ｇ（緑）、Ｂ（青）のカラーフィルタ９２とが組合わされたものの背面に光源９３を配設しておき、表示を希望する色素に対応する位置の液晶表示素子９１を駆動し透過状態とすることで前記光源９３からの光を透過させるものであり、このときに前記光源９３からの光は液晶表示素子９１を透過すると同時にカラーフィルタ９２も透過するものとなるので着色が行われ、カラー表示がなされるものとなる。

【０００３】

【発明が解決しようとする課題】しかしながら、前記従来のカラー液晶表示素子９０においては、その得られる表示の明るさが前記光源９３の明るさにより定められるものとなり、例えば晴天時の屋外など周囲の明るさが極めて明るい状態では表示を読み取ることが不可能となり、屋外使用が通常とされる機器に適する表示素子が得られないという問題点を生じ、この点の解決が課題とされるものとなっていた。

【０００４】

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顔料を分散し前記液晶カプセルの駆動時には入射光を前記反射板で反射させるものとし、該反射光を前記基材中の顔料により着色してカラー表示とすることを特徴とする反射光型カラー液晶表示素子を提供することで、前記した従来の課題を解決するものである。

【０００５】

【実施例】つぎに、本発明を図に示す実施例に基づいて詳細に説明する。図１に示すものは本発明の第一実施例であり、図中に符号１で示すものは反射光型カラー液晶表示素子（以下に、反射型カラー液晶１と略称する）である。

【０００６】前記反射型カラー液晶１は夫々に透明電極２ａ、３ａが設けられた前面基板２と背面基板３との間に、液晶カプセル４が内部に均一に分散された例えば紫外線硬化樹脂により成る透明な基材５を封止した、所謂、高分子分散型液晶の形態を有するものであり、このときに、前記基材５中には適宜な色相の顔料６で着色が行われているものとされ、前記背面基板３の背面側には例えばアルミ蒸着或いは銀色塗装などが行われ反射板７が形成されるものとされている。

【０００７】次いで、上記の構成とした反射型カラー液晶１の作用及び効果について説明を行えば、先ず、前記透明電極２ａ、３ａに電位が印加されていない状態、或いは前記透明電極２ａ、３ａが敷設されていない場所では液晶カプセル４内の液晶分子４ａは特定の方向性を持たないランダムな状態となり、これにより図１に示したように外光を乱反射し拡散光として反射する。

【０００８】この状態においては、前記前面基板２の近傍にある液晶カプセル４からの反射光が優勢となるので、前記基材５が顔料６により着色が行われているにも係わらず前記した反射光には殆ど着色は認められず、従って、反射型カラー液晶１の表面は白色又は乳白色として観視されるものとなる。

【０００９】ここで、前記透明電極２ａ、３ａに電位を印加すれば、前記液晶カプセル４内の液晶分子４ａは応動して、図に示すように前記前面基板２及び背面基板３に垂直な状態となり光を透過させて前記反射板７に到達させ、更に前記反射板７で反射した反射光を再度透過させて前記前面基板２から反射型カラー液晶１の外部に向けて放出させるものとなる。

【００１０】このときには、前記基材５には顔料６による着色が行われていることで、反射型カラー液晶１から観視方向に放出される反射光には当然に着色が行われるものとなりカラー表示が行われるものとなり、即ち、白地に有色図形（文字）で表示が行われるものとなる。

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を夫々の基板2　3に接する柱状として形成され、更に前記柱状の基材50は、前記したように適宜な顔料6などでマゼンタに着色された50M、イエローに着色された50Y、シアンに着色された50Cの三本で1ユニットとされ、このユニットの複数が設けられるものとされている。

【0012】加えて、これら基材50の前記反射板7側にはカラーフィルタ8が設けられるものとされ、マゼンタ色とされた基材50Mに対してはイエロー色とされたカラーフィルタ8Yが組合わされて反射光には赤色（R）光を生ずるものとされ、同様にイエロー色の基材50Yに対してはシアン色のカラーフィルタ8Cが組合わされて反射光には緑色（G）光を生ずるものとされ、シアン色の基材50Cに対してはマゼンタ色のカラーフィルタ8Mが組合わされて反射光には青色（B）光を生ずるものとされ、光の（加色）三原色が得られるものとなり、これを前記基材50の1ユニット単位で制御を行えば所謂、フルカラー表示が行えるものとなる。

【0013】

【発明の効果】以上に説明したように本発明により、基材中に液晶カプセルを分散せて構成する高分子分散型液晶の前記基材に着色を行うこと、或いは基材に着色を行うと共に適宜のカラーフィルタと組合わせることで、反射光によりカラー表示が行えるカラー液晶が得られるものとなり、例えば直射日光下など極めて明るい環境化においてもカラー表示を可能とし、この種のカラー液晶表示素子が採用される機器の使用条件の拡大などに優れた効果を奏するものである。また、反射光型としたこと

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で、従来は表示を行うために必要とされた背面に備えられる光源も不要とし消費電力の低減　構成の簡素化などコストダウンにも優れた効果を奏する。

【図面の簡単な説明】

【図1】　本発明に係る反射光型カラー液晶表示素子の第一実施例を駆動が行われていない状態で示す断面図である。

【図2】　同じ実施例の駆動状態を示す断面図である。

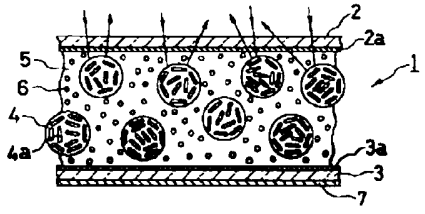
【図3】　同じく本発明の第二実施例を示す断面図である。

【図4】　従来例を示す断面図である。

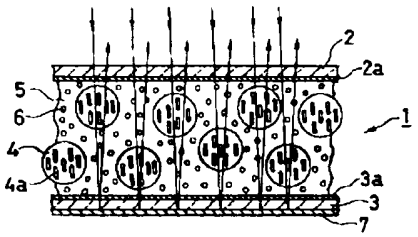
【符号の説明】

1……反射光型カラー液晶表示素子
2……前面基板
2a……透明電極
3……背面基板
3a……透明電極
4……液晶カプセル
5、50……基材
50M……マゼンタ色基材
50Y……イエロー色基材
50C……シアン色基材
6……顔料
7……反射板
8……カラーフィルタ
8M……マゼンタ色カラーフィルタ
8Y……イエロー色カラーフィルタ
8C……シアン色カラーフィルタ

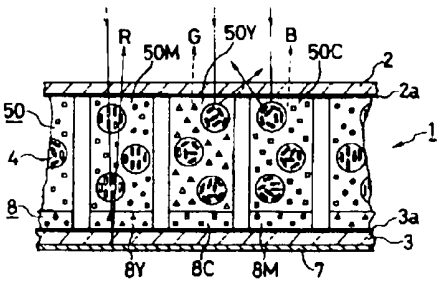
【図1】




【図2】



【図3】




【図4】

